IG (Space) Working Group Report on Space Launch Policy

INTRODUCTION

The IG Working group on Space Launch Policy was tasked to identify issues that had an FY-84 budget impact and provide recommendations to the IG (Space) by November. The only FY-84 budget issue identified was the **NASA requirement to fund a fifth orbiter production start in FY-84.**

The Working Group constrained its review of this essentially programmatic issue to the policy implications of either starting fifth orbiter production in FY-84 or not. Several reasons for this approach were considered pertinent. First, the composition, background, and talents of the Working Group members were such that detailed programmatic issues could not be independently evaluated. Second, inadequate time was available to visit the operational NASA centers to seek and objectively review technical, production, and financial data. And finally, the charter of the Working Group was felt to be confined to general policy level issues.

Consequently, the approach chosen was to base our review on previously accomplished, more detailed, studies and analyses updated by the most current information available from NASA and their prime contractors. New data or responses to Working Group questions were considered in the context of previous studies and conclusions. No attempt was made to verify or validate the programmatic material presented.

DISCUSSION

An initial review was made by the Working Group to confirm that the **orbiter was, in fact, the critical path to STS operations** rather than facility through-

put or other factors. NASA's data confirmed this to be the case by FY-88 — after the initial system build-up.

Based on this conclusion, we next reviewed the STS capability and demand studies as well as the most current NASA data. Based on this information, an optimistic STS capability under the most favorable operating conditions was compared to the STS manifest through FY-88. The confidence in even these relatively solid missions becomes lower in the FY 87-88 timeframe; however, enough other considerations existed such as the three year lead time for commercial satellites and the uncertainty in the physical ability to mix the various payloads on a single mission, for the Working Group to conclude that the manifest represented the most conservative demand projection for this study.

The Working Group estimated that under best case conditions, an average of 7.5 flights per year, per orbiter, was achievable. This is optimistic in that it assumes the turn-around time at Vandenberg to be equal to that at Kennedy; during the period considered, FY 86-88, this is optimistic by essentially a factor of two (i.e., 60 days at Vandenberg vs 28 days at Kennedy). The need for major inspection and maintenance was recognized and estimated to require five months of down time after every 25 orbiter missions. This effectively reduces the operational flights per year, per orbiter, to 6.6. This estimate was used by the Working Group when comparing capability against the manifest demand.

The evaluation shows that four orbiters can provide 26 flights per year under essentially favorable conditions. This only marginally satisfies the manifest in FY-88 (i.e., 23 flights); the loss of a single orbiter in services, and, in

fact, any number of other unfavorable conditions, precludes satisfying the demand.

Examples of such unfavorable conditions were identified and the associated impacts estimated in a gross sense:

- Major Configuration Upgrades - Orbiter modifications and upgrades were considered extremely likely; a near-term example is the Centaur modifications required in FY-86 to support the Galileo and International Solar Polar Mission. The effect of these modifications and the critical spacing of the launch windows (i.e., 30 days apart) in reality lowers the effective rate for these two orbiters to four flights each for this specific year.

- Major Anomaly or Failure - While the STS has been extremely successful to date, only five missions, using a single orbiter, have been flown. A major system problem during the FY 83-88 period was considered to be likely. This would require analysis, possibly additional inspection and testing, and conceivably the grounding of the entire fleet until the issues were resolved. Based on comparisons with US Expendable Launch Vehicles (ELVs) and selected aircraft programs, an estimate of one to six months was thought to be realistic. No reasonable means of estimating the frequency of such an occurrence was identified.

- Forced Landing at a Contingency Landing Site - The requirement to land at a contingency site outside the continental United States was also considered a possible occurrence during the FY 83-88 period. Even if no damage to the orbiter was incurred, one to three months could easily be required to return the orbiter to the US and subsequent service.

- Accidents - Accidents were considered to be very likely; unfortunately, no intelligent means of estimating either the frequency or severity of such accidents were established. However, all operational experience intuitively indicates the prudence and need to plan for accommodating such problems. The pure statistical probability of losing one orbiter in 1983? is .509 at a reliability of 0.9996.

- Threats - Several evaluations of the system vulnerabilities to hostile acts have been performed. After reviewing these reports, the Working Group concluded that, while the probability of such an occurrence was low, the potential impact on STS operations was high. For instance, if an orbiter were damaged or destroyed, the systems capability would be effectively reduced by 25%. Isn't it really greater than just losing 1/4 of the fleet?

- Attrition - The present orbiter design requires 100 operational flights. No firm data exists to evaluate this specified lifetime. This could be unattainable or unduly pessimistic; only flight experience will provide the answer.

Such considerations, while judged to be realistic, were not quantitatively considered when comparing projected capability against the manifest.

A final concern of the Working Group was responsiveness to major repairs or modifcations during a period when the orbiter production capability was not active. The ability to bring tooling out of storage, recertify it and the necessary personnel, acquire materials, fabricate, test, qualify and deliver a major replacement such as a wing, while not technically in question, poses a serious potential scheduling problem. NASA and contractor estimates to repair/replace a wing are on the order of sic months if the production base is in

place and 36 months if it is not. Such a situation was considered totally unacceptable for a critical, high visability, operational program.

CONCLUSIONS

While a comparison of optimistic capability estimates with the relatively conservative manifested demand through FY-88 shows four orbiters to be slightly in excess of that demand, enough other factors exist to make the conclusion questionable. Consequently, operations under the optimistic conditions assumed for this study are highly unlikely; prolonged operations with four orbiters, especially without an on-going orbiter production base, is considered to be high risk.

While no single factor conclusively drives a conclusion that fifth orbiter is required, the combination of the many system uncertainties generate a concern that a fifth orbiter may be required ultimately to reliably assure an operational availability of four orbiters.

don't make defacto endorsement of 5th orbiter prog (next page)

Clearly the US Government should not simultaneously cannot abandon its proven ELV capability as is currently programmed by FY-88, transition totally to the STS as its only access to space, and ~~concurrently release~~ drastically dismantle the orbiter production base.

~~This is inconsistent~~ would be completely inconsistent with the current US space policies and creates an unwarrented risk to all elements of the US space program. In fact, the concept of disbanding orbiter production and repair capability is an antithesis ~~counter~~ to the realities of a continued commitment to the STS as our prime access to space. Attrition alone requires a periodic replacement or orbiters; if the 100 flight per orbiter life estimate is accurate and five years are required to deliver another orbiter, initial production of a replacement orbiter for Columbia

would be required around 1990 with three subsequent replacements started over the next three to four years.

Collectively these considerations led the Working Group to conclude that the need for a fifth orbiter is too narrow an issue. The basic issue that must be consciously decided in the context of current Presidential policies, rather than an isolated budget decision, is the need to maintain a continued commitment to an available and responsive orbiter production capability.

The programmatic strategy of the most cost-effective program to maintain the production capability is the responsibility of NASA as the STS Program Manager. That issue is considered to be beyond the scope of the charter of the Working Group. However, the option currently proposed by NASA, i.e., the production start of a fifth orbiter in FY-84, is one option that satisfies all the concerns and issues posed by the Working Group.

RECOMMENDATIONS

- The Senior Interagency Group (Space) should confirm the need to maintain a responsive and viable orbiter production and repair capability to successfully implement US space policy.

- NASA, as the STS Program Manager, should continue to be charged with identifying the appropriate programmatic options to efficiently meet this objective.

- All Departments and Agencies with any interest in the STS program should continue to support NASA, as the Program Manager, in its efforts to achieve a fully operational and cost-effective system.